CLEAN CLAIMS VERSION

1.   A method for the determination of polymer molecular weight, comprising:

injecting a known volume of an analytical sample comprising a
5   polymer reaction product of a diphenyl carbonate and a dihydric phenol into a flow
analysis system comprising on line a chromatographic column and a sequential
concentration detector, and an off-line molar mass detector;

effecting a minimally dispersive separation of the analytical sample
with the chromatographic column to yield a high molecular weight fraction;

10   determining a polymer concentration in the high molecular weight
fraction using the concentration detector;

determining off-line the molar mass using the molar mass detector on a
diverted high molecular weight fraction and

deriving an average molecular weight from the polymer concentration
15   and the molar mass;

wherein the total analysis time is not greater than about 5 minutes per sample.

4.   The method of claim 1, wherein the polymer comprises an
aromatic polycarbonate.

20   5.   The method of claim 1, wherein the dihydric phenol is selected
from the group consisting of 2,2-bis-(4-hydroxyphenyl)propane; hydroquinone;
resorcinol; 2,2-bis-(4-hydroxyphenyl)pentane; 2,4'-dihydroxydiphenylmethane; bis-
(2-hydroxyphenyl)methane; bis-(4-hydroxyphenyl)methane; bis-(4-hydroxy-5-
nitrophenyl)methane; 1,1-bis-(4-hydroxyphenyl)ethane; 3,3-bis-(4-
25   hydroxyphenyl)pentane; 2,2'-dihydroxydiphenyl; 2,6-dihydroxynapthylene; bis-(4-
hydroxyphenyl)sulfone; 2,2'-dihydroxydiphenylsulfone; 4,4'-dihydroxydiphenylether;

4,4'-dihydroxy-2,5-diethoxydiphenylether; and 1,1-bis(3-methyl-4-hydroxyphenyl)cyclohexane.

6.   The method of claim 4, wherein the analytical sample comprises the polymer reaction product in a suitable solvent.

7.   The method of claim 6, wherein the suitable solvent is selected from the group consisting of benzene, toluene, xylene, chloroform, tetrahydrofuran, methylene chloride, trichloroethylene, dichloroethane, chlorobenzene, dichlorobenzene, trichlorobenzene, methyl acetate, ethyl acetate, hexafluoroisopropanol, and mixtures comprising at least one of the foregoing solvents.

8.   The method of claim 6, wherein the suitable solvent is selected from the group consisting of benzene, toluene, xylene, chloroform, tetrahydrofuran, dichloromethane, and mixtures comprising at least one of the foregoing.

9.   The method of claim 1, wherein the analytical sample comprises a polymerization reaction mixture.

10. The method of claim 9, wherein the minimally dispersive separation yields a high molecular weight fraction substantially free of monomers and polymerization catalysts.

11. The method of claim 1, wherein the chromatographic column comprises at least one size exclusion chromatographic column.

12. The method of claim 1, wherein the minimally dispersive separation yields a high molecular weight fraction having a baseline peak width less than about 30 seconds at least one of the molar mass detector or the concentration detector.

13. The method of claim 1, wherein the minimally dispersive separation yields a high molecular weight fraction having a baseline peak width less

than about 20 seconds at least one of the molar mass detector or the concentration detector.

14. The method of claim 1, wherein the minimally dispersive separation yields a high molecular weight fraction having a baseline peak width less than about 10 seconds at least one of the molar mass detector or the concentration detector.

15. The method of claim 1, wherein the minimally dispersive separation yields a high molecular weight fraction having a peak width at half height less than about 10 seconds at least one of the molar mass detector or the concentration detector.

16. The method of claim 1, wherein the minimally dispersive separation yields a high molecular weight fraction having a peak width at half height less than about 5 seconds at least one of the molar mass detector or the concentration detector.

17. The method of claim 1, wherein the minimally dispersive separation yields a high molecular weight fraction having a peak width at half height less than about 3 seconds at least one of the molar mass detector or the concentration detector.

18. The method of claim 1, wherein the concentration detector utilizes one or more detection methods selected from the group consisting of infrared absorption spectroscopy, ultraviolet absorption spectroscopy, differential refractive index detection, fluorescence detection, ultrasonic detection, and evaporative light scattering detection.

19. The method of claim 1, wherein the molar mass detector utilizes one or more detection methods selected from the group consisting of light scattering, low angle light scattering, multiangle light scattering, and viscometry.

20. The method of claim 1, wherein the molar mass detector utilizes multiangle light scattering.

21.   The method of claim 1, wherein determining the polymer concentration and determining the molar mass are conducted sequentially.

5   23.   The method of claim 1, wherein the total analysis time is not greater than about 3 minutes per ~~sample~~. *e sample*

24.   The method of claim 1, wherein the total analysis time is not greater than about 1 minute per sample.

25.   The method of claim 1, wherein the total analysis time is not
10   greater than about 40 seconds per sample.

26.   The method of claim 1, wherein the average molecular weight is a weight average molecular weight.

27.   The method of claim 1, wherein the average molecular weight is a number average molecular weight.

15   28.   A method for the determination of polymer molecular weight, comprising:

providing a sample array comprising a plurality of spatially differentiated sites, each site comprising a polymer resin reaction product of a dipehnyl carbonate and bisphenol A;

20   preparing an analytical sample for each spatially differentiated site by dissolving the polymer resin reaction product in a suitable solvent;

injecting a known amount of each analytical sample into a flow analysis system comprising a chromatographic column, a concentration detector, and a molar mass detector;

effecting a minimally dispersive separation of each analytical sample with the chromatographic column to yield a high molecular weight fraction comprising polycarbonate oligomers and polymers comprising at least two bisphenol A units, said fraction being substantially free of monomers;

5   determining a polymer concentration in the high molecular weight fraction of each analytical sample using the concentration detector;

determining the molar mass in the high molecular weight fraction of each analytical sample using the molar mass detector; and

deriving an average molecular weight for each analytical sample based
10   on the polymer concentration and the molar mass;

wherein the total analysis time is not greater than about 5 minutes per sample.

29.   The method of claim 28, wherein preparing an analytical sample for each spatially differentiated site, injecting a known amount of each
15   analytical sample, effecting a minimally dispersive separation of each analytical sample, determining the polymer concentration in the high molecular weight fraction of each analytical sample, determining the molar mass in the high molecular weight fraction of each analytical sample, and deriving an average molecular weight for each analytical sample are conducted without human intervention.

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31.   A system for the determination of polymer average molecular weight, comprising:

a solvent delivery system;

an autoinjector for injecting a known volume of an analytical sample
25   comprising a polymer reaction product of a dipenyl carbonate and a hihydric phenol;

a chromatographic column for effecting a minimally dispersive separation of the analytical sample to yield a high molecular weight fraction substantially free of monomers;

an in-line concentration detector for determining a polymer concentration in the high molecular weight fraction; and

a molar mass detector off-line from the column and concentration detector, for determining the molar mass in the high molecular weight fraction;

wherein the system's total analysis time is not greater than about 5 minutes per sample.

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34.   The system of claim 31, further comprising a plurality of analytical samples comprising aromatic polycarbonate.

35.   The system of claim 31, further comprising a sample

15   preparation module for automatically preparing an analytical sample by dissolving an aromatic polycarbonate resin in a suitable solvent.

36.   The system of claim 31, further comprising a computer for deriving an average molecular weight from the polymer concentration and the molar mass, and, optionally, for responsively controlling one or more of the solvent delivery

20   system, the autoinjector, the concentration detector, and the molar mass detector.

38.   The method of claim 28, wherein the minimally dispersive separation yields a high molecular weight fraction having a baseline peak width less than about 30 seconds.

39.   The method of claim 28, wherein the minimally dispersive separation yields a high molecular weight fraction having a baseline peak width less than about 20 seconds.

40.   The method of claim 28, wherein the minimally dispersive separation yields a high molecular weight fraction having a baseline peak width less than about 10 seconds.

41.   The method of claim 28, wherein the minimally dispersive separation yields a high molecular weight fraction having a peak width at half height less than about 10 seconds.

42.   The method of claim 28, wherein the minimally dispersive separation yields a high molecular weight fraction having a peak width at half height less than about 5 seconds.

43.   The method of claim 28, wherein the minimally dispersive separation yields a high molecular weight fraction having a peak width at half height less than about 3 seconds.